UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,258	09/10/2004	Giuseppe Pezzotti	P09409US00/DEJ	4864

881 7590 12/08/2009

STITES & HARBISON PLLC
1199 NORTH FAIRFAX STREET
SUITE 900
ALEXANDRIA, VA 22314

EXAMINER	
RAMDHANIE, BOBBY	
ART UNIT	PAPER NUMBER
1797	

MAIL DATE	DELIVERY MODE
12/08/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/507,258	PEZZOTTI, GIUSEPPE	
	Examiner	Art Unit	
	BOBBY RAMDHANIE	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 August 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20,22-50 and 54-57* is/are pending in the application.

4a) Of the above claim(s) *1-16 and 29-43* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-20,23-28,44-50 and 55-57* is/are rejected.

7)☒ Claim(s) *22 and 54* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Allowable Subject Matter

1. Claims 22 & 54 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

2. The following is a statement of reasons for the indication of allowable subject matter: Claim 22 adds the additional limitation of a composition analyzing unit that analyses a partial difference of composition of the specimen further provided at a measurement site before stress is applied so that the stress calculating unit calculates stress based on the partial difference of composition at the measurement site to Claim 17. Claim 54 adds the additional limitation of a composition analyzing unit that determines the composition of the specimen and that adjusts the calculated stress by the calculating unit on the basis of the determined composition relative to a predetermined composition standard for the specimen to Claim 44. The prior art of record does not suggest nor disclose these combination of limitations for the device nor the system, respectively.

3. In order to better serve the Applicant, assist the Applicant to claim the actual invention, and to further the instant application to an **ALLOWANCE**, the Examiner has prepared a proposed claim (for Claim 17) that would be **ALLOWABLE** and would overcome the prior art rejections. This proposed claim amendment would be required

for all of the independent claims to both the device and system (as the claims pertaining to the method are withdrawn from consideration).

4. Claim 17: A stress measuring device for measuring a stress in a specimen comprising: A) An electron beam irradiating unit that irradiates a specimen with an electron beam; B). A spectroscopy unit that analyzes light generated from the specimen when the specimen is irradiated by irradiation with the electron beam from the irradiating unit so as to obtain a spectrum of only the electrons hitting ~~generated light from~~ the specimen; C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum of the generated light obtained as the specimen is irradiated with the electron beam from the irradiating unit when the specimen is in a predetermined state and when the specimen is in a state different from the predetermined state; and D). A composition analyzing unit that determines the composition of the specimen and that adjusts the calculated stress by the calculating unit on the basis of the determined composition relative to a predetermined composition standard for the specimen.

Election/Restrictions

5. Applicant's election with traverse of Group I Claims 17-28 & 44-57 in the reply filed on 08/31/2009 is acknowledged. The traversal is on the ground(s) that the Examiner “has grossly misinterpreted the teachings of Sakata et al” and that Sakata et al “does not show or teach that the electron beam has anything to do with the

spectrometer/detector (Please see remarks Page 1 & 2 of 8)." This is not found persuasive. The following reasons are why:

6. Applicant's claims are toward a device (NOT the METHOD of using the device).

7. Claim 17 now recites: A stress measuring device for measuring a stress in a specimen comprising: A) An electron beam irradiating unit that irradiates a specimen with an electron beam (See Abstract and Figure 1 electron beam/electron gun); B). A spectroscopy unit that analyzes light generated from the specimen when the specimen is irradiated by irradiation with the electron beam from the irradiating unit so as to obtain a spectrum of the generated light from the specimen (See Abstract, Raman Spectrum requires Spectroscopy unit & [0013] & Figure 1); and C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum of the generated light obtained as the specimen is irradiated with the electron beam from the irradiating unit when the specimen is in a predetermined state and when the specimen is in a state different from the predetermined state (See Abstract; frequency shift values at each scanning point by a computer [0013]).

8. Applicant argues that the Examiner has grossly misinterpreted the Sakata et al reference, however a proper reading of the reference (including [0013]), and Figure 1 shows that the sample is irradiated by the electron beam AND light from the sample's response to the electron beam is then focused to the spectrometer and stress calculating unit by the half mirror (See Figure 1 Item 14).

9. The requirement is still deemed proper and is therefore made FINAL.

10. Applicant's arguments, see Remarks, filed 08/31/2009, with respect to Claims 17-28 & 44-57 have been fully considered and are persuasive. The rejection of 112 to Claims 17-28 & 44-57 has been withdrawn.

11. Applicant argues that Sakata et al does not disclose Applicant's alleged invention because it is fundamentally different than what Applicant is claiming. Applicant states that, "This clearly differs from the invention of the present application as set forth in independent claims 17 & 44, which recites irradiating an electron beam onto a specimen to observe the light spectrum generated by the electrons hitting the specimen."

12. Applicant's argument that Sakata et al et al does not disclose the alleged invention contains flawed reasoning because "irradiating an electron beam onto a specimen to observe the light spectrum generated by the electrons hitting the specimen" is not recited as such in the instant claims. The scope of this limitation is different than the scope of the claims that are recited.

13. There is no recitation in the claims that the device is configured for "irradiating an electron beam onto a specimen to observe the light spectrum ONLY generated by the electrons hitting the specimen." The spectroscopy unit in Claim 17 is recited as follows: "a spectroscopy unit that analyzes light generated from the specimen when the specimen is irradiated with the electron beam from the irradiating unit so as to obtain a spectrum of the generated light from the specimen." The light generated by the sample is NOT restricted only to the electrons hitting the specimen.

14. This limitation is different in the scope of the invention being argued above in Paragraph 11 because of the following: 1). The claims are not limited only to an electron

beam source (note: “comprising") and the only light spectrum generated by the electrons hitting the specimen; 2). In Figure 1 of Sakata et al et al, light is scattered back to the spectroscopy unit and is shown to be sent and reflected off of the half-mirror to the analysis unit (Applicants have not shown with scientific evidence that none of the electrons hitting the specimen are not detected by the spectroscopy unit); and 3). The light generated from the specimen is not limited to the electrons hitting the specimen."

15. Applicant argues a method of using an alleged invention in an attempt to overcome the prior art rejections, however this is not persuasive because the device of Sakata et al may be operated in the same manner. Applicant has not shown with scientific and factual evidence that the device of Sakata et al can not be operated in the same manner/method.

Claim Objections

16. Claims 45-50 & 54-57 are objected to because of the following informalities: The system is being claimed as “The system as claimed claim…" should be rewritten to recite “The system as claimed in claim…” Appropriate correction is required.

Claim Rejections - 35 USC § 102

17. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

18. Claims 17, 18, 23, 24, 27, 28, 44, & 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakata et al.

19. Applicant's claims are toward a device.

20. Regarding Claims 17, Sakata et al et al discloses the stress measuring device for measuring a stress in a specimen comprising: A). An electron beam irradiating unit that irradiates a specimen with an electron beam; B). A spectroscopy unit that analyzes light generated from the specimen when the specimen is irradiated .by irradiation with the electron beam from the irradiating unit so as to obtain a spectrum of the generated light from the specimen, and C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum of the generated light obtained as the specimen is irradiated with the electron beam from the irradiating unit when the specimen is in a predetermined state and when the specimen is in a state different from the predetermined state.

21. Additional Disclosures Included: Claim 18: The stress calculating unit calculates a residual stress where the predetermined state is that where there is no stress in the specimen and the different state is that where there is a residual stress exists in the specimen; Claim 23: An external light irradiating unit that irradiates external light whose spectrum is known (See Figure 1 Item 10; light source); Claim 24: Further including a visualizing unit that visualizes a portion to be measured of the specimen so that the portion can be accurately measured again (See Figure 1 spectroscope and image processing system & [0007]); Claim 27: A stress measuring device for measuring a stress in a specimen comprising: A). A light irradiating unit that irradiates a specimen

with irradiating light; B). A spectroscopy unit that analyzes light generated from the specimen by the irradiating light from the irradiating unit so as to obtain a spectrum of the generated light; and C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum of the generated light obtained as the specimen is irradiated with the light from the irradiating unit when the specimen is in a predetermined state and when the specimen is in a state different from the predetermined state, wherein the light irradiating unit includes a broad area light irradiating device that irradiates the irradiating light on a broad area of the specimen that is broad compared with a smaller spot size of the irradiating light that is narrowed down to obtain a requested space resolution, and wherein the stress calculating unit is adapted to use the spectrum obtained by analyzing light generated from the specimen by light from the broad area irradiating unit as the predetermined state where no stress exists in the specimen (See rejections above. The device of Sakata et al et al can be used in this manner/method; See Figure 1, electron gun, Items 15 & 16 spectroscope; Item 8 computer; Item 10 light source, and objective lens); Claim 28: A stress measuring device for measuring a stress in a specimen comprising: A). A light irradiating unit that irradiates a specimen with irradiating light; B). A spectroscopy unit that analyzes light generated from the specimen by the irradiating light from the irradiating unit so as to obtain spectrum of the generated light; and C). A stress calculating unit that calculates a stress change in the specimen based on a shift of the spectrum of the generated light obtained as the specimen is irradiated with the light from the irradiating unit when the specimen is in a predetermined state and when the

specimen is in a state different from the predetermined state, wherein the light irradiating unit includes a broad area light irradiating device that irradiates the irradiating light on a broad area of the specimen that is broad compared with a smaller spot size of the irradiating light that is narrowed down to obtain a requested space resolution with scanning of the smaller spot, and wherein the mentioned the stress calculating unit; is adapted to use an average of spectra of the generated light from the specimen in the broad area as the spectrum in the predetermined state where no stress exists in the specimen (See above rejections); Claim 44: A system for measuring stress in a specimen with an electron beam comprising: A). An irradiating unit that irradiates the specimen with an electron beam; B). A measuring unit hat provides measurement signals of the generated radiation from the specimen after irradiation with the electron beam from the irradiating unit; and C). A calculating unit that calculates the stress on the specimen from the measurement signals by determining a spectrum shift between a first spectrum of the generated radiation from the specimen when the specimen is in a predetermined reference state and a second spectrum of the generated radiation from the specimen measured at a predetermined measurement position on the specimen (See Rejections above); and Claim 56: The system as claimed claim 44 further including a light radiating unit that illuminates the specimen with light and a light measuring unit for measuring radiation from the specimen after contact with the light radiation to provide a peak reference for compensation of the electron beam calculated stress by the calculating unit (See Figure 1; Items 10, 15, & 16).

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

23. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

24. Claims 19, 20, 25, 26, 45-50, 55, & 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakata et al et al in view of Pezzotti.

25. Applicant's claims are toward a device.

26. Regarding Claims 19, 20, 47, & 48, Sakata et al et al discloses the stress measuring device as claimed in claim 17, except for further including an external force impressing unit that applies an external force to the specimen is measured by stress calculating unit. Sakata et al et al does however disclose that the stress measurements are conducted on LSI components, components that are used in large scale integrated circuit chips. Pezzotti discloses a stress measuring device which includes an external force impressing unit (See Figure 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify device of Sakata et al et al with

the external force impressing unit, because the device of Sakata et al et al is designed partly for the testing of LSI components, components that are commonly made out of ceramic materials such as silicon nitride.

27. Additional Disclosures Included: Claim 20: The stress calculating unit obtains an internal stress from a spectrum shift between an internal stress impressed spectrum in a state that the internal stress is generated in the specimen by the external stress impressing unit and the specimen spectrum or the stress impressed spectrum (See Pezzotti, Page 870); Claim 47: A stress force applying unit wherein the predetermined reference state is determined by measuring the first spectrum with the measuring unit while exerting a stress force on the specimen of a predetermined value with the stress force applying unit and by measuring the second spectrum with the measuring unit at the predetermined measurement position is-measured without exerting the stress force (See Rejections above); Claim 48: The stress force of the stress force applying unit is applied mechanically to the specimen (See Pezzotti Figure 2).

28. Regarding Claims 25 & 57, Sakata et al et al discloses the stress measuring device as claimed in claims 17 & and the system of Claim 44, except wherein a diameter of a beam spot of an the electron beam irradiated by the electron beam irradiating unit is not more than 100 nm, or the system as claimed claim 44 wherein said irradiating unit irradiates the predetermined measurement position by an electron beam having a diameter of 10 nm or less.

29. Sakata et al et al does however disclose a number of optical components to shape the electron beam including a condensing lens, and a deflecting coil, and also an objective lens.

30. Pezzotti discloses microstructures in SEM photos where the measurement position is no more than 10 nm or less (See Figures 1, 6, 7).

31. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify beam spot of the electron beam irradiating unit to be not more than 100 nm in diameter since the resolution of the microstructures of the SEM photos in Pezzotti are no more than 100 nm and 10 nm or less (See Figure 1).

32. Regarding Claim 26, the combination of Sakata et al et al and Pezzotti disclose the stress measuring device as claimed in claim 17, except wherein the electron beam irradiating unit is a scanning electron microscope. Sakata et al et al does however disclose an imaging system, detectors and an electron beam irradiating unit (See [0007] spectroscope & scanner which scans an electron ray).

33. Pezzotti discloses the use of an SEM to visualize str ess microstructures (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the SEM into the device of Sakata et al et al, to be able to correlate directly SEM images with the Raman Spectrum obtained simultaneously without moving the sample from one device to the other to obtain the spectrums and thus introduce additional stress onto the sample.

34. Regarding Claims 49 & 55, the combination of Sakata et al et al and Pezzotti disclose the system as claimed in Claims 47 & 44, except wherein the stress force of the stress force applying unit is applied thermally to the specimen or a temperature control unit for controlling the temperature of the specimen during the measurement by the measuring unit to a predetermined temperature. It would have been obvious to one of ordinary skill in the art to apply a thermal stress force and a temperature control unit for controlling the temperature of the specimen during the measurement by the measuring unit to a predetermined temperature because it is well known in the art of electronics that LSI components develop failure at temperatures above their optimum working conditions.

35. Regarding Claim 50, the combination of Sakata et al et al and Pezzotti discloses the system as claimed in claim 47, except wherein the predetermined reference state is measured by the measuring unit over a plurality of different stress forces exerted by the stress force applying unit to correlate the amount of external force and the corresponding spectrum shift.

36. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device to include the plurality of different stress forces wherein the predetermined reference state is measured because LSI components expand and contract depending on their environment that they are in which involves a plurality of different forces acting on the component at one time (heat, cold, torsional strain, compression, expansion, etc).

37. Regarding Claim 45, Sakata et al et al discloses the system as claimed claim 44 except wherein the calculating unit is adapted to determine the first spectrum of the predetermined reference state by averaging a plurality of measurements across the specimen to approximate a stress-free state for the specimen. Pezzotti discloses the first spectrum of the predetermined reference state is determined by the calculating unit by averaging a plurality of measurements across the specimen to approximate a stress-free state for the specimen (See Page 870 whole page). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the calculating unit (computer) with the algorithm of Pezzotti since it is common practice to automate mathematical alogrithms in experimental studies so that they are carried out by computers.

38. Regarding Claim 46, Sakata et al et al discloses the system as claimed in claim 45 wherein the irradiating unit is adapted to direct the electron beam to enable a plurality of measurements representative of an area of the specimen. Sakata et al et al does not disclose that the area of the specimen is approximately 100 times as large as or larger than the predetermined measurement position.

39. Sakata et al et al does however disclose that the specimens are indeed macroscale (LSI components).

40. It would have been obvious to one of ordinary skill in the art to operate the device to obtain measurements of a plurality of measurements of an area of the specimen wherein the area of the specimen is approximately 100 times as large or larger than the

predetermined measurement position as a design choice to obtain a desired sized image of the specimen.

Telephonic Inquiries

41. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

42. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

43. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BOBBY RAMDHANIE whose telephone number is (571)270-3240. The examiner can normally be reached on Mon-Fri 8-5 (Alt Fri off).

44. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

45. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

46. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. R./

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797